

Information Communication Technology (ICT) — Supported Mathematics Instruction For Students With Disabilities

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Abstract

This study examined Information Communication Technology (ICT) — Supported Mathematics Instruction for Students with Disabilities using two Selected Secondary Schools in Ijebu-Ode and Abeokuta South Local Government Area of Ogun State. The Research used questionnaire from respondents from all the selected schools. The SPSS (Statistical package of Social Science) was used to analyze the result of data collected using Chi-square.

The result shows that:

(i) There is significant difference between the academic performances of students with disabilities taught using Information Communication technology (ICT) — Supported Mathematics Instructional Materials and those taught using chalkboard method.

(ii) There is no significant difference between male and female students with disabilities academic performance in teaching and learning of mathematics.

(iii) There is significant difference between students with disabilities taught using audio-visual materials and those taught using audio materials.

Keywords: Information and Communication Technology (ICT), Chi-square, Disabilities, Assessment, and Video and Audio Materials

1. Introduction

Information Communication Technology (I.C.T) has become essential in almost every educational, employment community and recreational environment. Access to electronic and Information Communication Technology (I.C.T) can help students with a wide range of abilities and disabilities prepare for and succeed in adult life. Specifically for people with disabilities, such access has the potential to maximize independence, productivity and participation in academic programs, employment, recreation and other adult activities. In addition, for those who have the interest and aptitude advanced Information Communication Technology skills can open doors to high-tech career fields that were once unavailable to people with disabilities.

However, most people would agree that a major goal of schooling should be the development of students' understanding of basic mathematical concepts and procedures. All students including those with disabilities and those at risk of school failure need to acquire the knowledge and skills that will enable them to "figure out" math-related problems that they encounter daily at home and in figure work situations. Unfortunately, there is considerable evidence to indicate that this objective is not being met, especially for children exhibiting learning difficulties. Since the first discouraging result of mathematics achievement reported by the National Assessment of Educational Progress (NAEP) in 1973, there has been little evidence to suggest that mathematics achievement has improved significantly, especially for student with disabilities.

Therefore, many students with disabilities face mathematics with dread and trepidation. Higher expectations, compounded with more curricula, add to the challenge. As demonstrated by the most recent National Assessment of Educational Progress, students with disabilities continue to underachieve in mathematics (Paris Griggs & Dion, 2005).

Student with high – incidence disabilities such as learning disabilities and mild cognitive impairments struggle with computation and problems solving skills, reading and comprehension, and applying strategies. Research has shown that students with disabilities are falling farther behind their non-disabled peers in retention and recall of basic facts through the elementary years (Cawley etal., 1996, Hasselbring, Lott and Zydrey, 2005), jeopardizing their success with higher mathematics such as algebra that are required in middle and high schools.

Finally, the using of instructional, technology tools like Video and Audio-visual material to enhance mathematics instruction in disabled class. For example, technology represents mathematical concepts in different ways that can be meaningful to them. It can provide support for students who have trouble remembering mathematical facts and procedure or whose fine motor skills make writing problem and drawing diagrams difficult.

The flexibility and interactivity that are inherent in Information Communication Technology can help students who otherwise avoid mathematics become engaged in the subject better.

This research is to investigate Information Communicational Technology (ICT) supported mathematics instruction for student with Disabilities.

Although, the teachers are aware of the improvement which Information and Communication Technology has brought into the teaching of mathematics several studies has found out that daily studies and practices can help student increase both their speed in calculation and their accuracy in recalling basic facts (Miller, Butter, and Lee 1998).

2. Purpose of study

The purpose of this study is to critically look into the Information Communication Technology (ICT) supported mathematics Instruction for students with disabilities in Nigeria.

The underground factors affecting the disabled students performance in mathematics is identified. However this study will help to give accurate reason for reduction of disabled students' poor performance in mathematics and how Information Communication Technology (ICT) supported instruction could be used to enhance the performance of the students. This study will specifically attend to find out

(i) Effects of anchored instruction Information Communication Technology (ICT) in teaching mathematics

(ii) Effects of Information Communication Technology — supported instruction materials in the academic performance of disabled students in mathematics.

3. Research Question

This research will make an attempt to answer among others the following questions:

(i) What are the effects of anchored instruction on disabled students academic performance in mathematics

(ii) What are the effects of Information Communication Technology (I.C.T) – Supported Instruction in mathematics on students academic performance.

(iii) How does Information and Communication Technology have effects on the disable students performance in teaching and learning of mathematics.

4. Research Hypothesis

This could be test in the course of this research and those that are to be tested are:

i. there is no significant difference in the performance of students taught using Information Communication Technology (I.C.T) – supported instructional materials and the students taught using chalkboard method.

ii, there is no significant difference between male and female students academic performance in teaching and learning of mathematics.

iii. there is no significant difference between students taught with audio-visual material and students taught with audio material.

5. Research Methodology

This study is designed mainly to investigate the Information Communication Technology (ICT)-Supported Mathematics Instruction for Students with Disabilities in two selected Secondary Schools in Ogun State, Nigeria.

6. Targeted Population

The targeted population was two selected secondary schools in Ogun State, Nigeria. Some of the special teachers were randomly selected and interviewed. The belief of the Researcher was that investigation and results would be enough for data analysis. The schools were:

1. Adeola Odutola College, Ijebu-Ode
2. St. Peters' Secondary School, Abeokuta.

7. Sampling, size and sampling techniques

The questionnaires were well distributed to the teachers in the selected secondary schools. The respondents were employed and beseeched to respond to all issues raised with sincerity of purpose. Fifty (50) teachers were interviewed based on random selection in as much ever teacher of the schools cannot be interviewed. The view of these fifty (50) respondents would be used to generalize the teachers view.

8. Research instrument and description

The main research instrument used was questionnaire. The questionnaire had two (2) sections A and B. section A contained data such as the Name, Class taught, Gender, Age bracket. Section B was made up of fifteen (15) statements which were centered on the relevant issues. Each item had two possible response options "Yes" and "NO"

The scoring of the response options was as follows, Yes = 1 and No = 2. The respondents were allowed to mark into the appropriate column of their choice on Information Communication Technology (ICT) — Supported Mathematics Instruction for Students with Disabilities.

9. Procedure for data collection

The researcher endeavored to adopt a sort of unliterary approach to data collection process. Questionnaire were distributed is the teachers in the selected secondary schools. The questionnaires were distributed daily.

10. Procedure for data analysis

Questionnaires were distributed to respondents and issues contained in them were those that involved the use of Information Communication Technology (ICT) – Supported Mathematics Instruction for Students with Disabilities.

However, the various responses were collected for the bases of data interpretation and analysis. This method would be used in chi-square. The questionnaires were analysed using Statistical Package for Social Science (SPSS).

The chi-square was used to analyze whether.

i. There is no significant difference between the academic performances of students with Disabilities taught using Information Communication Technology (ICT) – supported Mathematics Instructional materials and those taught using chalkboard method.
ii. There is no significant difference between male and female students with disabilities academic performance in teaching and learning of mathematics.
iii. There is no significant difference between students with disabilities taught using audio-visual materials and taught using audio materials.

Chi-Square formula

X^2 S $(O_1 - E_1)^2$

O_1 Observed frequency in the i-th class

E_1 Expected frequency in the i-th class

9. Data Presentation and Interpretation

Gender

Table I.

	Observed N	Expected N
MALE	21	25.0
FEMALE	29	25.0
TOTAL	50	

** = 1.280, * = 3.841, df =1

Table II

	Observed N	Expected N
MALE	21	25.0
FEMALE	29	25.0
TOTAL	50	

** = 1.280, * = 3.841, df = 1

The above table I and II show the gender distribution frequency of the schools. The result shows that there is no significant difference between male and female academic performance.

Age

Table III

	Observed N	Expected N
21-30	15	12.5
31-40	21	12.5
50 and Above	3	12.5
TOTAL	50	

** = 13.680, * = 7.815, df = 3

Table IV

	Observed N	Expected N
21-30	13	12.5
31-40	21	12.5
41-50	13	12.5
50 and Above	3	12.5
TOTAL	50	

** = 13.040, * = 7.815, df = 3

The above tables show the age distribution frequency of the schools. The highest age distribution was recorded in (31-40) while the lowest was recorded in (50 and above). The result shows that there is significant difference in the age distribution of the respondents.

Question 1: The use of ICT has immensely enriched the performance of students with disabilities in mathematics

Table V

	Observed N	Expected N
YES	47	25.0
NO	3	25.0
TOTAL	50	

** = 38.720, * = 3.841, df= 1

Table VI

	Observed N	Expected N
YES	47	25.0
NO	3	25.0
TOTAL	50	

** =38.720, * =3.841, df =1

The tables above show that there is significant difference between the performance of students with disabilities taught using ICT — supported mathematics instruction and those taught using chalkboard method.

Question 2: Through exposure to ICT facilities students with disabilities are able to solve more problems on their own.

Table VII

	Observed N	Expected N
YES	47	25.0
NO	3	25.0
TOTAL	50	

** = 38.720, * = 3.841, df = 1

Table VIII

	Observed N	Expected N
YES	44	25.0
NO	6	25.0
TOTAL	50	

** = 28.880, * = 3.841, df = 1

The result shows that there is significant difference between the performances of students with disabilities taught using ICT — supported mathematics instructional materials and those students with disabilities taught using chalkboard method.

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Question 3:ICT enables students with disabilities to get more familiar with new topic taught.

Table IX

	Observed N	Expected N
YES	47	25.0
NO	3	25.0
TOTAL	50	

** = 38.720, * 3.841, df = 1

Table X.

	Observed N	Expected N
YES	47	25.0
NO	3	25.0
TOTAL	50	

** = 38.720, * = 3.841, df = 1

The result shows that there is significant difference between how students with disabilities taught using ICT — supported mathematics instructional materials and the disabled students taught using chalkboard method get familiar with new topics.

Question 4: ICT has helped the students with disabilities to have long memory of the topic taught

Table XI.

	Observed N	Expected N
YES	47	25.0
NO	3	25.0
TOTAL	50	

** = 38.720, * = 3.841, df = 1

The result shows that there is significant difference between long memory of students with disabilities taught using ICT — supported mathematics instructional materials and those taught using chalkboard method.

Question 5: With ICT facilities, topics are made more concrete and practicable.

Table XII

	Observed N	Expected N
YES	45	25.0
NO	5	25.0
TOTAL	50	

** = 32.000, * .= 3.841, df = 1

The result shows that topics are made more concrete and practicable with ICT facilities.

Question 6: ICT facilities increase interest in Students with disabilities attending mathematics class.

Table XIII

	Observed N	Expected N
YES	42	25.0
NO	8	25.0
TOTAL	50	

* * = 23, 120, * =3.841, df = 1

The result shows that ICT facilities increase in Students with disabilities attending mathematics class.

Question 7: Teaching of mathematics with ICT facilities encourage interaction between students with disabilities and the teacher.

Table XIV

	Observed N	Expected N
YES	43	25.0
NO	7	25.0
TOTAL	50	

** = 38.720, * 3.841, df = 1

The result shows that teaching of mathematics with ICT facilities encourage interaction between students with disabilities and the teachers.

Question 8: ICT makes learning more permanent in the students with disabilities

Table XV

	Observed N	Expected N
YES	43	25.0
NO	7	25.0
TOTAL	50	

* * = 23, 920, * =3.841, df = 1

The result shows that ICT makes learning more permanent in the students with disabilities.

Question 9: Students with disabilities understand mathematics better with the use of ICT during teaching.

Table XVI

	Observed N	Expected N
YES	46	25.0
NO	4	25.0
TOTAL	50	

** = 35.280, * = 3.841, df = I

The result shows that Students with disabilities understand mathematics better with the use of ICT

Question 10: ICT gives room for self-learning process.

Table XVII

	Observed N	Expected
YES	46	25.0
NO	4	25.0
TOTAL	50	

** = 35.280, * = 3.841, df = I

The result shows that ICT gives room for self-learning process.

Question 11: ICT increases participation of students with disabilities in the class.

Table XVIII

	Observed N	Expected
YES	45	25.0
NO	5	25.0
TOTAL	50	

** = 32.000, * = 3.841, df = 1

The result shows that ICT increases participation of students with disabilities in the class

Question 12: Teachers teach faster with the aid of ICT facilities.

Table XIX

	Observed N	Expected
YES	40	25.0
NO	10	25.0
TOTAL	50	

** = 18.000, * = 3.841, df= 1

The result shows that teachers teach faster with the aid of ICT facilities.

Question 13: Male students with disabilities perform better than female students with disabilities in mathematics using ICT facilities.

Table XX

	Observed N	Expected
YES	9	25.0
NO	41	25.0
TOTAL	50	

** = 20.480, * = 3.841 , df = 1

The result shows that there is significant difference between the male and female students with disabilities academic performance in teaching and learning of mathematics using ICT.

Table XXI

	Observed N	Expected N
YES	2	25.0
NO	48	25.0
TOTAL	50	

* * = 42.320, * = 3.841, df = 1

The result shows that there is significant difference between the male and female students with disabilities academic performance in teaching and learning of mathematics using ICT.

Question 14: Female students with disabilities perform better than female students with disabilities in mathematics using ICT facilities

Table XXII

	Observed N	Expected N
YES	18	25.0
NO	32	25.0
TOTAL	50	

** = 3.920, * 3.841, df = 1

The result shows that there is significant difference between the male and female students with disabilities academic performance in teaching and learning of mathematics using ICT.

Table XXIII.

	Observed N	Expected N
YES	6	25.0
NO	44	25.0
TOTAL	50	

* * = 28.880, * 3.841, df = 1

The result shows that there is significant difference between the performance of male and female students with disabilities academic performance in teaching and learning of mathematics using ICT.

Question 15: Students with disabilities taught with audio-visual facilities perform better than students taught with audio facilities. Table 17a & b

Table XXIV

	Observed N	Expected N
YES	43	25.0
NO	7	25.0
TOTAL	50	

** = 25.920, * = 3.841, df = 1

The result shows that there is significant difference between students with disabilities taught with audio-visual facilities and those taught with audio-facilities.

10. Discussion of findings

In this study, research was on the Information Communication Technology (ICT) Supported mathematics Instruction for students with disabilities. The result shows that the students with disabilities taught using Information Communication Technology (ICT) – Supported Mathematics Instructional materials perform better than those taught using chalkboard method.

Furthermore, the result shows that there is no significant difference in the performance of male and female students with disabilities academic performance in teaching and learning of mathematics, because it shows that male and female students with disabilities are able to recollect what they have learnt with the aid of anchored learning method.

More so, from the result, it was obtained that there is significant difference between students with disabilities taught using audio-visual materials and those taught using audio materials.

Therefore, this research indicated that anchored learning or the use of Information Communication Technology (ICT) — supported mathematics instruction for students
with disabilities should be encouraged in the special schools in Nigeria

11. Conclusion

It has been shown from this study that there is significant difference in the performance of students with disabilities taught using Information Communication technology (ICT) –supported mathematics instructional materials and those taught using chalkboard method. The study also shows that there is no significant different between male and female students with disabilities academic performance in teaching and learning of mathematics.

Furthermore, the research result indicates that there is significant difference between the performance of students with disabilities taught using audio-visual and those taught with audio materials. This implies that students with disabilities would perform like normal students on the usage of Information Communication Technology (ICT).

More so, parents of children with disabilities should not see them as useless children in the society.

In addition, the children with disabilities should not see themselves inferior to normal students; they can do virtually all what the normal students could.

Finally, the recognition of students with disabilities and provision of Information Communication Technology (ICT) — supported mathematics Instructional materials would aid the mathematics learning and teaching in Nigeria.

12. Recommendation

Many students experience problems learning mathematics, and quantitative abilities are critical for many jobs. Yet mathematics instruction for students with disabilities and those with learning difficulties has never received the attention provided to reading instruction. These areas needs to be look into as can be seen by the dates of many of these publications, this situation has slowly but forcefully been changing.

We can begin by offering several general observations about this body of research and its historical evolution. We then discuss implications for designing interventions for students who are struggling.

References

Anstrom, T. (2006). *Achieving mathematical literacy: Interventions for students with learning disabilities.* Washington, DC. American Institutes for Research. Available at www. Cited. Org.

Bottage B.A., Heinrichs, M., Mehta, Z.D., & Hung, Y.H. (2002). *Weighing the benefits of anchored instruction for students with disabilities in general education classes.* The journal of Special Education, 35(4), 186-200.

Bottage B.A., Heinrichs, M., Chan, S., Mehta, Z.D., & Watson, E. (2003*). Effects of video-based and applied problems on the procedural maths skills of average and low-achieving adolescents.* Journal of Special Education Technology, 18(2), 5-22.

Bransford, J., Sherwood, R.., Vye, N., Riesser, J. (1996). *Teaching thinking and problem solving* American Psychologist, pp. 1078-1089.

Cawley, J., Parrmar, R., Yan,W., & Miller, J. (1998). *Arithmetic computation performance of students with learning disabilities: implications for curriculum.* Learning Disabilities Research and Practice, (pp. 68-74).

Christensen, C., & Gerber, M. (1990). *Effectiveness of computerized drill and practice games in teaching basic math facts.* Exceptionality,(pp. 149-165).

Garnett, K. (1998). Math learning disabilities. Learning Disabilities Research & Practice, November.

Goldman, S. & Hasselbring, T. (1997). *Achieving meaningful mathematics literacy for students with learning* *disabilities.* Journal of Learning Disabilities, 30(2), 198-208.

Hasselbring, T.S., Lott, A., C., & Zydney, J.M. (2005). *Technology-supported math instruction for students with disabilities: Two decades of research and development.* Washington, DC: American Institutes for Research. Available at www.cited.org.

Lesh, R. (1981). *Applied mathematical problem solving. Education Studies in Mathematics*, (pp.235 264).

Loveless, T. (2003, February 6). *Trends in math achievement: The importance of basic skills.*Presentation at the Mathematics Summit, Washington, DC.

Miller, S.P. Butler, F.M., & Lee, K.H. (1998). *Validated practices for teaching mathematics to students with learning disabilities:* A review of literature. Focus on Exceptional Children, (pp.1-24)

Perie, M., Grigg, W., & Dion, G. (2005). *The Nation's report card*: Mathematics 2005 (NCES 2006453). U.S Department of Education, National Center for Education Statistics. Washington, DC: US Government Printing Office.

Resnick, L.B. (1983). *A development theory of number understanding*. In Herbert P. Ginsburg (Ed.),The development of mathematical thinking (pp. 109-151). New York: Academic Press.